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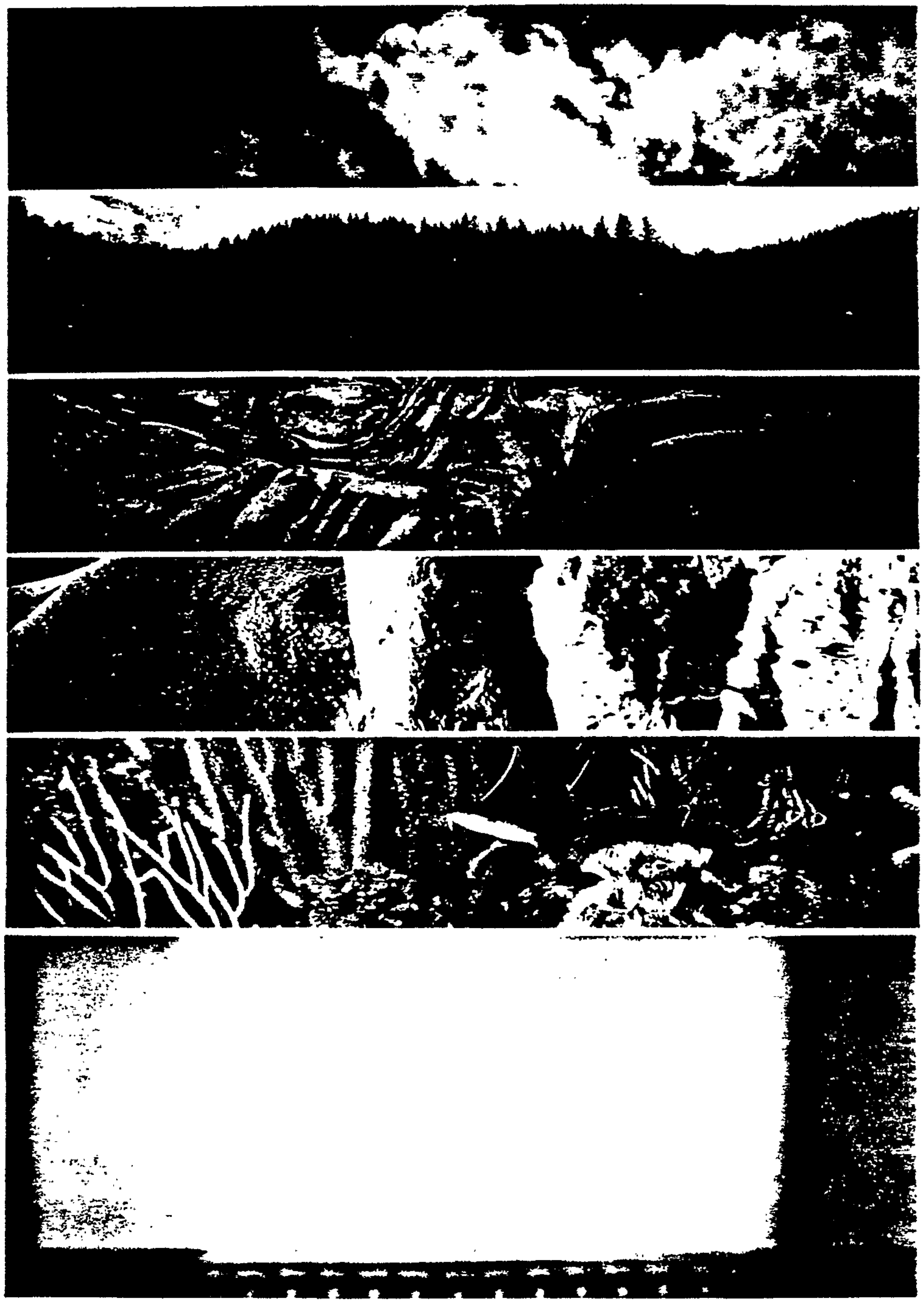

Dames & Moore

AR300154

PROJECT OPERATIONS PLAN
FOR
THE REMEDIAL INVESTIGATION AND FEASIBILITY STUDY
Mid-Atlantic Wood Preservers Site
Harmans, Maryland

Addendum to Volume I
Work Plan

Dames & Moore

7101 Wisconsin Avenue, Suite 700, Bethesda, Maryland 20814

AR300155

November 13, 1987

DAMES & MOORE A PROFESSIONAL LIMITED PARTNERSHIP
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November 18, 1987

Mr. Michael Bass
Hydrogeologist (3HW16)
DELMARVA-DC/WV CRES
U.S. Environmental Protection Agency
841 Chestnut Street
Chestnut Building
Philadelphia, PA 19130

Dear Mr. Bass:

Enclosed is a copy of our revised addendum to the Draft Work Plan for the Remedial Investigation and Feasibility Study, Mid-Atlantic Wood Preservers Site, Harmans, Maryland, dated March 11, 1987.

As discussed during our telephone conversation today, cross-references to the Work Plan are given in the left-hand margin of this addendum in the form: (page number/section number).

We are prepared to begin work on the Site Operations Plan immediately upon notification of the acceptability of this addendum.

Sincerely,

DAMES & MOORE

H.S. Gill

H.S. Gill, Ph.D.
Partner (Ltd)

Paul Lagace

Paul Lagace
Hydrogeologist

Enclosure

cc: Mr. David Healy
Office of Environmental Program
Waste Management Administration
State of Maryland Department of Health
and Mental Hygiene

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GENERAL COMMENTS

We are confident that the groundwater flow direction indicated by the five previously monitored wells, by topography and by surface water flow patterns, is still valid. However, we acknowledge that the current validity of historical groundwater flow patterns will have to be verified with recent data. As indicated in the Work Plan, we propose that the depth to water be measured in all wells and that all wells be surveyed for location and elevation. We propose that this
(pg/sect)+ information be used to construct a piezometric surface map before the wells are sampled. This information from the modified well locations shown in Figure 1 will
35/3.1 allow us to evaluate current groundwater flow directions. After current groundwater flow directions are determined, a conference call with EPA and the State will be made. If flow directions are northwest as expected, groundwater sampling will proceed as planned. If flow directions are in another direction, an additional 2-well cluster will be installed across Shipley Avenue from Mid-Atlantic Wood Preservers. *

SPECIFIC COMMENTS

27/2.6 1) A fourth bullet will be added to the list of objectives of the MAWP site remedial investigation on page 27 and will read:

- o Evaluate the extent (area and depth) of groundwater contamination at the site.

35/3.1 2) We suggest that since the depth to water will routinely be measured from the top of the PVC, that both the PVC and the concrete apron be surveyed. Slippage of the well casing can be periodically checked by measuring the distance between the concrete apron and the top of the PVC.

36/3.1 3) A number of methods for analyzing data from pump tests of partially penetrating wells are available. These methods include Dagan, 1967; Kipp, 1973; Neuman, 1974; and Sayed, 1984. These and other appropriate references will be

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*Indicates additions made to Dames & Moore's September 18 letter to MAWP in response to the EPA and State of Maryland's comments on the Draft Work Plan. These changes were agreed to at the November 6, 1987, meeting between EPA, the State of Maryland, MAWP, and Dames & Moore.

+Indicates cross-reference to page no. and section no. of Draft Work Plan.

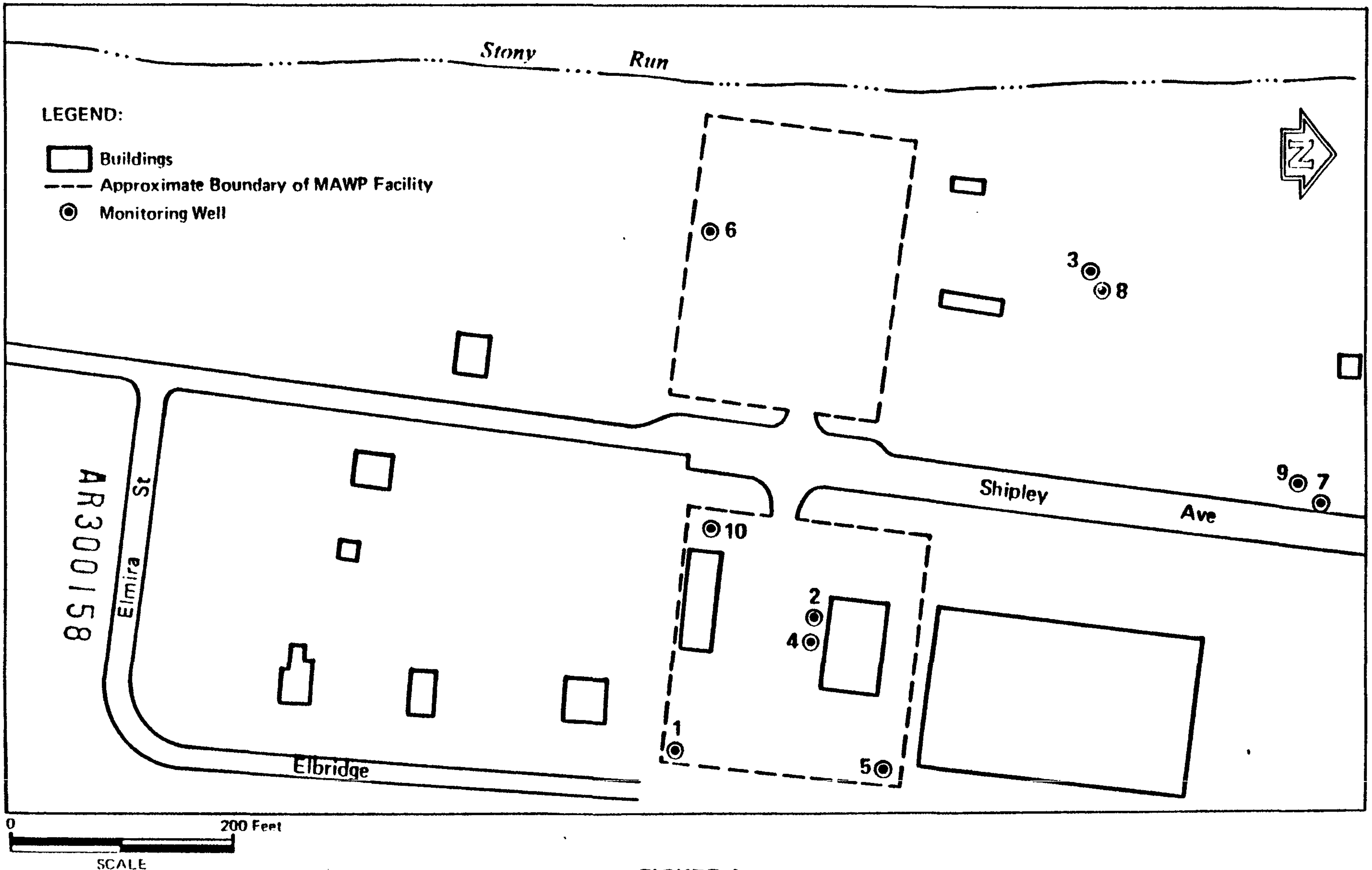

FIGURE 1
PROPOSED MONITORING WELL LOCATIONS

Base from Aerial Photo

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reviewed, and the method most appropriate for the MAWP site will be selected. The procedures of the method will be outlined in the Site Operations Plan.

30/3.1 4) The modified well locations are shown in Figure 1. They include a well in the drip pad area a deep well adjacent to proposed well #2 and a well in the southwest corner of the eastern half of the facility.

7/2.2 5) No pump test data collected specifically for the analysis of the confining properties of the Arundel Clay could be located. However, several other types of information--including laboratory permeability tests, modeling studies, groundwater chemistry, and observations of well field drawdowns--support the conclusion that the Arundel Clay is an effective confining layer. Four samples obtained from the Arundel Clay in Baltimore were subjected to laboratory permeability tests, with resultant values ranging from 1.36×10^{-8} to 5.18×10^{-10} ft/second (Chester Engineers, 1986). In a groundwater modeling study of the Potomac Group in the Baltimore area (Chapelle, 1986), leakance of the Arundel Formation was simulated at from 1.2×10^{-10} to 10^{-13} per second. These values were estimated on the basis of laboratory permeability tests and extensive model calibration, and are consistent with the values obtained by Chester Engineers, if an average Arundel Clay thickness of 60 feet in the Baltimore area is assumed.

The Arundel Clay in the area of the site is considerably thicker than in Baltimore, as indicated by Figures 2-2 and 2-3 of the Work Plan and by the following from Mack (1962): "The Glen Burnie area is underlain by about 400 to 500 feet of sedimentary strata which contain the only two aquifers, sands in the Patuxent and Patapsco Formations. These formations are separated by about 200 feet of clay, known as the Arundel Clay which effectively seals the water-bearing sands in the Patuxent from those in the Patapsco."

Other evidence of the effectiveness of the Arundel Clay as a confining layer includes the fact that although pumping of the Patuxent Formation in the Sparrows Point area has caused drawdown on the order of 50 feet in this aquifer, no corresponding drawdown in the overlying aquifer has been noted. Also, in the Glen Burnie area, distinct differences in the dissolved oxygen concentrations of water from the Patapsco Formation as compared to that from the Patuxent indicate that there has been little mixing of water from these two aquifers (Chapelle, 1987).

STATE'S COMMENTS

/3.1 1) As was discussed in response to EPA's General Comments and as will be discussed in response to the State's comment number 4, surveying and measuring of depth to water in the proposed wells will allow for adequate definition of groundwater flow conditions at the site.

2) We agree that due to the uncertainty of the direction of current groundwater flow, well locations should be selected so as to investigate assumed upgradient as well as downgradient locations. This is reflected in the modified proposed monitoring well locations shown in Figure 1 and discussed in the response
27/2.6 to the State's comment number 4. The extent to which Stony Run serves as a hydraulic boundary will be determined by the use of stream gauging and flow net construction. The discharge of the stream will be measured at one location up stream from the facility, and at one location downstream. The difference in discharge between the 2 locations, divided by the length of stream between the locations, will allow a determination of the rate of groundwater discharge to, or recharge from the stream to be made. This information, along with the piezometric surface data collected from water level measurements in the proposed wells, will allow a flow net to be constructed. The flow net is a cross section of the stream and aquifer showing the lines of flow of the groundwater, and the approximate depth to which the stream acts as a hydraulic boundary. Details of the method to measure stream discharge, such as the technique to be used and measurement locations, will be described in detail in the Site Operations Plan.

28/2.6 3) Table 1 indicates our proposed supplemental geotechnical soil analysis plan. It is standard practice for the site geologist to determine soil type by visual inspection of all samples collected. This information will be recorded in appropriate field logs, as indicated in the Work Plan. All samples collected for geotechnical analysis will be collected using a Dames & Moore type-U sampler. The general procedure will be to analyze three clay and three sand samples each for the data of interest. Standard soil lab procedure is to analyze the sample for permeability and then determine the hydraulic conductivity from the formula:

$$K = \frac{kpg}{u}$$

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where:

K = hydraulic conductivity

k = permeability

p = fluid density

g = acceleration of gravity

u = dynamic viscosity.

Since the variables are well known for groundwater, only permeability need be determined. Several slug tests, recovery tests, and a pump test for wells screened in sand are being proposed. These tests will be supplemented by laboratory permeability tests on sand. Three laboratory permeability tests on clay samples, as proposed in the Work Plan, are included in Table 1. We propose that pH be measured on all soil samples submitted for chemical analysis.

TABLE 1

Summary of Proposed Geotechnical
Soil Analysis

Analysis	Number of Samples		
	Clay	Sand	Total
Density	3	3	6
Porosity	3	3	6
Permeability	3	3	6
Percent Organic Matter	3	3	6
pH			38

31/3.1 4) Proposed monitoring well locations have been modified as indicated in Figure 1. Wells 4 and 5 originally proposed to be located near Stony Run have been relocated closer to the assumed source of contamination. Wells 3 and 8 remain in the same direction from the assumed source as the original locations of wells 4 and 5, and in this respect, the original proposed locations for wells 4 and 5 were redundant. Well 4 is now located adjacent to well 2 at the location of the former spill and is proposed to be screened at a depth of from 70 to 80 feet to evaluate the potential for vertical migration of contaminants. Wells 5 and 6 have been relocated to near the northeast and southwest corners of the site, respectively, and will be useful for evaluating if groundwater flow directions vary from the suspected northwest direction. Well 10 has been added at the southwest corner of the eastern half of the facility, and will indicate whether there is any groundwater flow to the south.

32/3.1 5) Borings for all monitoring wells will have continuous split-spoon samples collected for the first 30 feet. Analysis for geotechnical data is discussed in the response to State comment number 3. All samples not submitted for analysis will be archived for 1 year.

32/3.1 6) Recovery rates of groundwater into monitoring wells after purging for well development will be recorded in addition to recording pumping rates and drawdowns, as indicated on page 36 of the Work Plan.

28/2.6 7) Our proposed supplemental geotechnical soil analysis plan is discussed in the response to the State's comment number 3 and is summarized in Table 1.

32/3.1 8) See response to State comment number 6.

38/3.2.3 9) We propose that two additional sediment samples be collected from Stony Run at locations midway between the three initially proposed locations (see
3.2.2 Figure 2). There have been 14 analyses of surface water from Stony Run for chromium, copper, and arsenic--only one of which had levels above detection (chromium, 0.22 ppm). The split of this sample was below detection. Stony Run is one continuously flowing stream along the 1,000+ feet of stream path near the MAWP facility. Therefore, three water samples will adequately determine if a surface water contamination problem exists.

38/3.2.3 10) Soil collection and analysis are discussed in the responses to State comment numbers 3 and 5. Assuming a confining unit of significant thickness is encountered, samples from above, within, and below the unit can be analyzed for the parameters outlined in Table 1.

Sampling locations have been revised, as shown in Figure 2, to cover a wider area and provide a more random sampling grid. Please note that samples from the three locations (six samples) near the drip pad have already been collected and analyzed for chromium, copper, and arsenic via EP toxicity extraction. Future testing for these metals will be by acid digestion to determine total concentrations. Soil samples will be collected for chemical analysis at depths of 0

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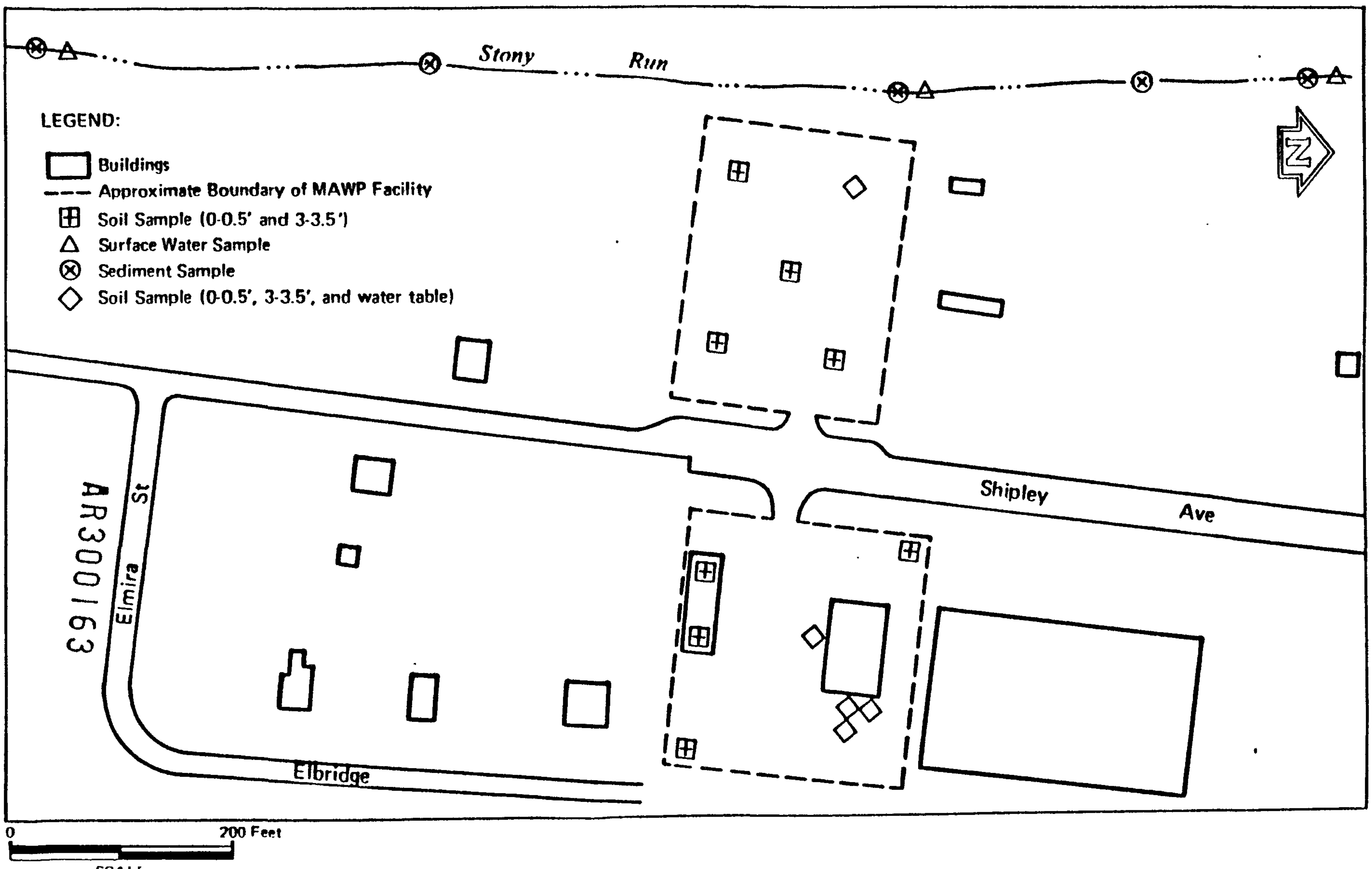

FIGURE 2
PROPOSED SOIL, SURFACE WATER, AND SEDIMENT SAMPLING LOCATIONS

Base from Aerial Photo

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to 0.5 and 3 to 3.5 feet at 13 locations. In addition, a soil sample composited from 2 feet above to 2 feet below the water table will be collected at 5 sampling locations. These locations will be the northwest corner of the site, near the former overflow pipe, and at 3 locations near the drippage collection pad. In addition, samples will be collected where visual evidence suggests that contamination is present.

A minimum of one clay sample and one sand sample will be collected from offsite and analyzed for chromium, copper, arsenic and pH to determine background levels for these parameters. Historical chemical analytical data will be reviewed to determine if any of this data represent background levels. If so, it will be compared with currently collected data to determine the mean and standard deviation of background concentrations.

11) Our proposed geotechnical soil analysis program is discussed in the response to State comment number 3 and is summarized in Table 1. In addition, we have revised our proposed environmental sampling plan, as shown in Table 2. The

40/3.2.4 revised plan includes nine soil samples and four groundwater samples, which will be analyzed for the parameters in the EPA Hazardous Substance List.

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(Replaces Table 3-1 of Draft Work Plan)

TABLE 2

Revised Summary of Proposed Environmental Samples

Type	Location	Depth	Number
Total Chromium, Copper, and Arsenic, and pH			
Surface Soil	Former Overflow Pipe	Surface, 3', water table	3
	Northwest Corner	Surface, 3'	2
	Drippage Collection Pad	Surface, 3', water table	9
	Southeast Corner	Surface, 3'	2
	Wood Storage Shed	Surface, 3'	4
	Storage Yard	Surface, 3',	8
	Storage Yard	Surface, 3', water table	3
Background		Surface	2
Sediment	Stony Run		5
Total Soil/Sediment*			38
Surface Water	Stony Run		3
Groundwater	Dames & Moore Wells		10
	Water Supply Wells		3
Total Water*			16
Hazardous Substance List			
Soil	Former Overflow Pipe	Surface, 3', water table	3
	Storage Yard	Surface, water table	2
	Drippage Collection Pad	Surface, water table	4
Total Soil			9
Groundwater	Dames & Moore Well No. 2		1
	Dames & Moore Well No. 3		1
	Dames & Moore Well No. 4		1
	Dames & Moore Well No. 8		1
Total Water			4

*Includes 9 soil and 4 water samples which will have been tested for chromium, copper, and arsenic under Hazardous Substance [illegible]st testing.

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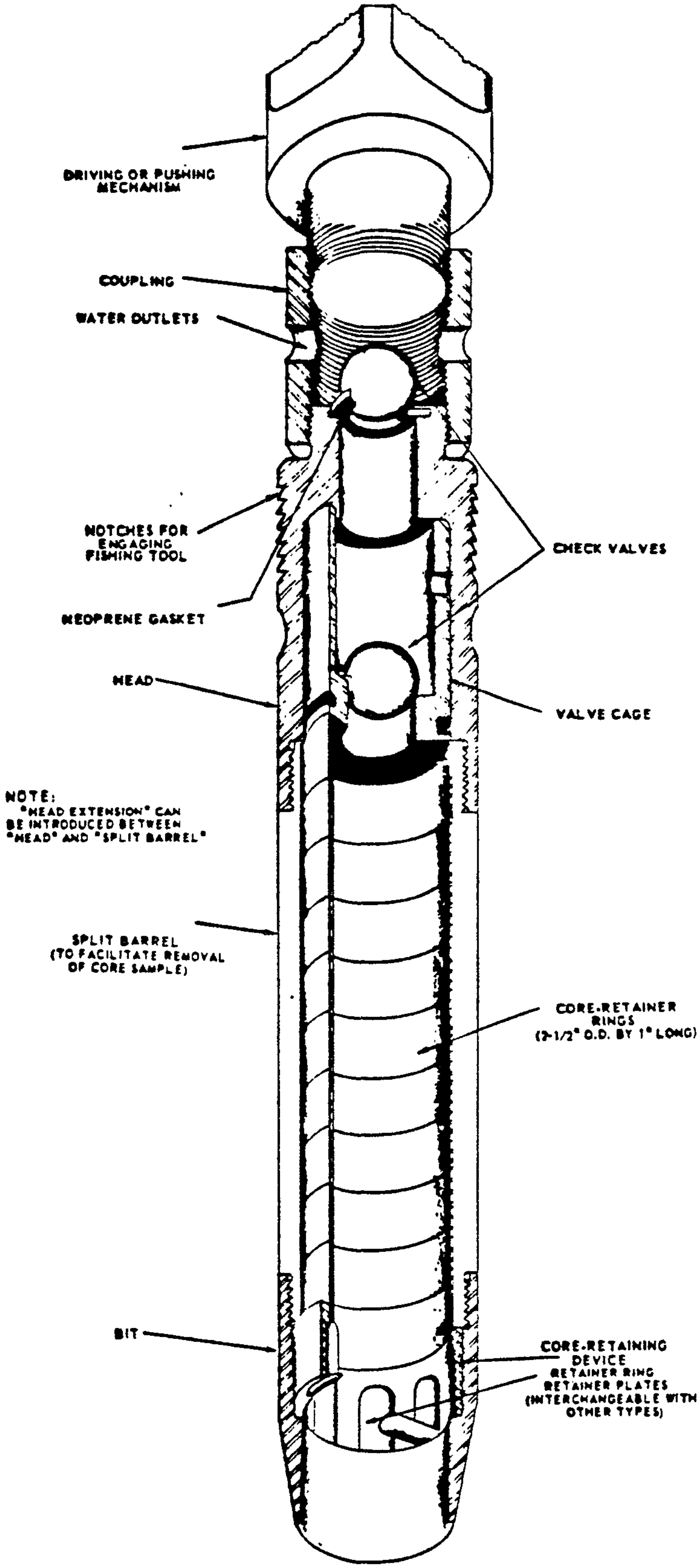
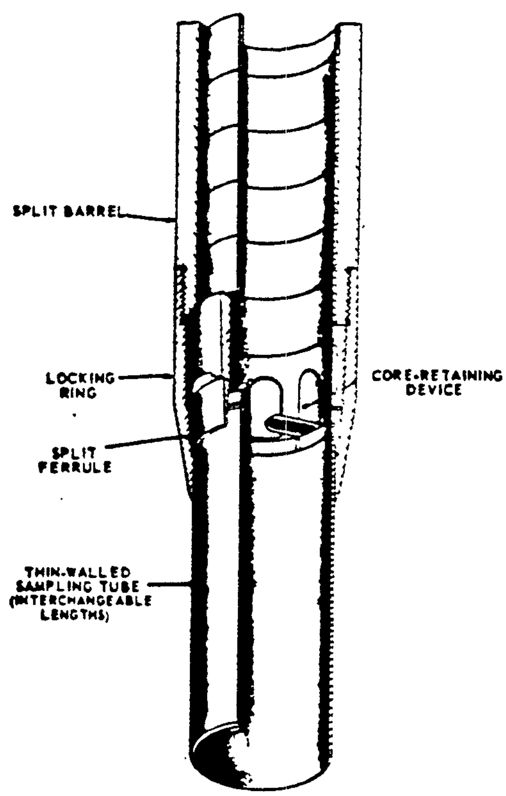


ALTERNATE ATTACHMENTS



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SOIL SAMPLER TYPE U

REFERENCES

Chapelle, F. H., 1987. Personal communication, U.S. Geological Survey, September 17, 1987.

Chapelle, F. H., 1986. "A Solute-Transport Simulation of Brackish-Water Intrusion Near Baltimore, Maryland," Ground Water, Vol. 24, No. 3, May-June 1986.

Chester Engineers, 1986. "Eastern Stainless Steel Company, Baltimore, Maryland: Report on Hydrogeologic Investigation," December 1986.

Dagan, G., 1967. "A Method of Determining the Permeability and Effective Porosity of Unconfined Anisotropic Aquifers," Water Resources Research, No. 3.

Kipp, K. L., 1973. "Unsteady Flow to a Partially Penetrating Finite Radius Well in an Unconfined Aquifer," Water Resources Research, No. 9.

Mack, F. K., 1962. Ground-Water Supplies for Industrial and Urban Development in Anne Arundel County, Maryland Department of Geology, Mines, and Water Resources Bulletin 26.

Neuman, S. P., 1974. "Effect of Partial Penetration on Flow in Unconfined Aquifers Considering Delayed Gravity Response," Water Resources Research, No. 10.

Sayed, S. A. S., 1984. "Observed Drawdown Pattern Around a Well Partially Penetrating a Vertically Extensive Water Table Aquifer," Ground Water, Vol. 22, No. 2, March-April, 1984.